Screening and early psychological intervention for depression in schools: systematic review and meta-analysis.

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Systematic review and meta-analysis

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Abstract Depression in children and adolescents is considerably undertreated, and the school may be a good setting for identifying and treating depression. We conducted a meta-analysis of studies in which students were screened for depression, and those with depressive symptoms were treated with a psychological intervention. Only randomised controlled trials were included. Eight studies met the inclusion criteria. Five studies focused on younger children (7–14 years) and three studies were aimed at adolescents (12–19 years). In total 5803 students were screened, of whom 7.2% were included in the intervention studies (95% CI: 7.1–7.3). The 'numbers-needed-to-screen' was 31 (95% CI: 27–32), which means that 31 students had to be screened in order to generate one successfully treated case of depression. The effects of the psychological treatments at post-test were compared to control conditions in the 8 studies comprising 12 contrast groups, with a total of 413 students. The mean effect size was 0.55 (95% CI: 0.35–0.76). There were not enough studies to examine whether specific psychotherapies were superior to other psychotherapies. Although the number of studies is small and their quality is limited, screening and early intervention at schools may be an effective strategy to reduce the burden of disease from depression in children and adolescents. More research on the (negative) effects of these interventions is needed.

Key words depression – children – adolescents – psychological treatment – meta-analysis

Introduction

With an estimated prevalence of up to 2.5% in children and up to 8.3% in adolescents, depression is a frequent condition in underage groups, with high recurrence rates, often-poor psychosocial and academic outcomes, and an increased risk for other mental disorders [4]. Furthermore, clinically relevant depressive symptoms that do not meet criteria for major depressive disorders are found in up to 30% of the adolescents [31]. By the age of 18, about one in every four adolescents has had at least one depressive episode [6, 21], and most adults with recurrent depression have their initial depressive episodes as teenagers [26].

It is not surprising, therefore, that in the last two decades several studies have examined the possibilities of preventing and treating child and adolescent depression with psychological interventions [31]. Although most prevention studies have found

ECAP 537

disappointing results [24], treatment studies in this area generally have positive findings [12, 20, 25, 27], and psychotherapy is generally considered to be the first treatment for most depressed youth [1].

One specific group of treatment studies has used the school system to screen for clinically relevant depression among students, and treat those suffering from depression. The school is one of the few settings through which all or nearly all children and adolescents can be reached, and because depression in these age groups is considerably undertreated [37], this may offer a strategy to improve treatment and health outcomes.

In this study, we will conduct a systematic review and meta-analysis of studies in which children and adolescents at school are screened for depression, and those with clinically relevant depressive symptomatology are treated. We will examine how many students have to be screened for one positive outcome ('numbers needed to screen') [3, 28], and how effective the treatments are compared to control conditions.

Method

Identification and selection of studies

Studies were traced by means of several methods. First, we used a large database of 766 papers on the psychological treatment of depression in general. This database was developed through a comprehensive literature search (from 1966 to June 2005) in which we examined 4,661 abstracts in Pubmed (1,127 abstracts), Psycinfo (1,225), Embase (925) and the Cochrane Central Register of Controlled Trials (1,384). We identified these abstracts by combining terms indicative of psychological treatment (psychotherapy, psychological treatment, cognitive therapy, behaviour therapy, interpersonal therapy, reminiscence, life review) and depression (both MeSH-terms and textwords). For this database, we also collected the primary studies from 22 meta-analyses of psychological treatment of depression [7, 8], including five meta-analyses of psychological treatment of depression in children and adolescents [11, 12, 25, 27, 33]. For the current study, we examined the abstracts of these 766 studies, and selected the ones which focused on psychological treatments in children and adolescents.

In addition, we examined the references of major reviews of the field [2, 13, 21, 34], we reviewed the reference lists of retrieved papers, and we entered each study into the ISI Web of Science database to find papers that had subsequently cited them. These papers were then evaluated for possible inclusion.

We included studies in which (-) a systematic screening procedure was used (-) at school (-) to identify students up to 18 years of age (-) with a depressive disorder or an elevated level of depressive symptomatology, (-) in which the effects of a psychological treatment of identified subjects was (-) compared to a control condition (-) in a randomised controlled trial. No language restrictions were applied.

The methodological quality of the studies was assessed using four basic criteria [15]: allocation to conditions is done by an independent person; adequacy of random allocation concealment to respondents; blinding of assessors of outcomes; and completeness of follow-up data.

Analyses

In this study, we focused on two outcomes: the mean effect of the interventions and the numbers-needed-to-screen (NNS). The mean effect is used in most meta-analyses of treatments for mental disorders [7, 8] and gives an estimate of the overall effect of the interventions. The numbers needed to screen indicates the number of subjects that have to be screened in order to generate one positive outcome, which in our case is one successfully treated case of depression [3, 28]. The NNS gives an indication of the effort that is needed to screen in routine practice and the relative number of positive outcomes of screening in routine practice.

First, we examined whether the treatments of depressed students were effective. We calculated effect sizes (d) by subtracting (at post-test) the average score of the control group (M_e) from the average score of the experimental group (M_c) and dividing the result by the average of the standard deviations of the experimental and control group (SD_{ec}). An effect size of 0.5 thus indicates that the mean of the experimental group is half a standard deviation larger than the mean of the control group. Effect sizes of .56–1.2 can be assumed to be large, while effect sizes of .33–.55 are moderate, and effect sizes of 0–.32 are small [23].

In the calculations of effect sizes we only used those instruments that explicitly measure depression (Table 1). When means and standard deviations were not reported, we used other statistics (t-value, P-value) to calculate effect sizes. If more than one depression measure was used, the mean of the effect sizes was calculated, so that each study (or contrast group) had only one effect size. In some studies, more than one experimental condition was compared to a control condition. In these cases, the number of subjects in the control condition was evenly divided over the experimental conditions so that each subject was used only once in the meta-analyses.

Table 1 Selected characteristics of controlled studies examining the effects of screening and early treatment of depression in school settings

Study	Inclusion criteria	Schools	Age	Conditions	*N*	Intervention	Measurements	Measures	Criteria for impr	CNT
Clarke et al., 1995 [5]	CES-D≥24 and no MDD	3	15–16	1. CBT 2. Usual care	76 74	15 45-minute sessions; 3 per week	Pre; post; 6, 12 mn	CES-D; HDRS; K-SADS-E (DSM-III-R)	–	US
De Cuyper et al., 2004 [9]	(CDI ≥ 11 or CBCL-int ≥ 63) and 1 symptom of MDD but no MDD	4	10–12	1. CBT 2. WL	11 11	16 weekly sessions of 1 hour + 2 booster sessions	Pre; post; 4 mn	CDI, CBCL,	–	Belgium
Kahn et al., 1990 [18]	3 times a high score on CDI + RADS	1	10–14	1. CBT 2. Relaxation training 3. Self-modelling treatment 4. Waiting list control	17 17 17 17	1 & 2: 12 +2 sessions; groups of 2–5; 3: 12 individual sessions	Pre; post; 1 mn	CDI RADS	CDI ≥ 15; RADS ≥ 72	US
Lamb et al., 1998 [19]		1	14–19	1. CBT 2. No treatment control	27 19	8 weekly group sessions, groups of 10–12	Pre; post	RADS	–	US
Liddle & Spence, 1990 [22]	CDI≥19 and CDRS-R>40		7–11	1. CBT 2. Attention placebo (drama) 3 No treatment	11 10 10	8 weekly 1-hour session; groups of 4–6	Pre; post 3 mn;	CDI	–	Australia
Reynolds & Coats, 1987 [29]	BDI≥10 and RADS≥72	1	12–18	1. CBT 2. Relaxation training 3. Waiting list control	9 11 10	10 50-minute sessions, 2 per week, groups of 5	Pre; post; 5 wk	BDI; RADS; BID	BDI < 10	US
Stark et al., 1987 [30]	CDI>16 and CDI>13 on 2nd occasion	1	9–12	1. Self control therapy 2. Behavioural problem solving 3. Waiting list control	9 10 9	12 group 45–50 minute sessions in 5 weeks; groups of 5	Pre; post	CDI; CDS CDRS-R CBCL-D	CDI≥13; CDRS-R≥40	US
Weisz et al., 1997 [34]	CDI≥11 and CDRS≥34	3	9–12	1. PASCET program (CBT) 2. No treatment control	16 32	8 group sessions of 50 minutes; small groups (<6)	Pre; post; 9 mn	CDI; CDRS-R	1 SD above mean on CDI and CDRS-R	US

Abbreviations: CBT: cognitive behaviour therapy; WL: waiting list; CNT: country; impr: improvement; mn: months

To calculate pooled mean effect sizes, we used the computer program Comprehensive Meta-analysis (version 2.2.021), developed for support in meta-analysis. We decided to calculate mean effect sizes both with the random and the fixed effects model in all analyses, but because we found little indications of heterogeneity we only report the results of the fixed effects model.

As indicator of homogeneity, we calculated the *Q*-statistic. We also calculated the I^2-statistic which is another indicator of heterogeneity [16], in percentages. A value of 0% indicates no observed heterogeneity, and larger values show increasing heterogeneity, with 25% as low, 50% as moderate, and 75% as high heterogeneity.

The second outcome we focused on was the 'numbers-needed-to-screen' (NNS) [3, 28]. We took several steps in order to calculate the NNS.

First, we examined in each study the total number of students who were screened, and the proportion of this total number of subjects who were randomised to the experimental or control condition.

It appeared not to be possible to give pooled estimates of the number of students for whom parental informed consent is received, because parental consent was asked in some studies before the screening, while in others informed consent was asked after the screening, but before the intervention. The studies also did not have comparable procedures on more elaborate interviews for those who score positively on the screening instrument. Therefore, we could only examine the final pooled proportion of students who met the inclusion criteria and were randomised to conditions.

Next, we selected the studies which reported dichotomous outcomes. These dichotomous outcomes could indicate the proportion of subjects who scored below a certain score on a questionnaire or it could indicate the proportion of subjects who recovered from a depressive episode.

In the next step, we calculated for each comparison group how many positive outcomes would have been realised in the randomised group (compared to the control group), if they had all received the intervention. Thus, we had an indication of how many positive outcomes are generated by the screening plus intervention, compared to no intervention. This number allowed us to calculate the NNS for each study, and the pooled NNS.

Results

Description of studies

We retrieved a total of 56 papers on treatment studies of child and adolescent depression. Most of these (*N*=44; 78.6%) were excluded because they did not systematically screen subjects for depression at school. One study (two papers) [10, 17] was excluded because the subjects were not randomly assigned to conditions, and two studies were excluded because the subjects were not selected on the basis of predefined levels of depressive symptomatology [30, 36]. The remaining eight studies met the inclusion criteria and were included in the current study. Selected characteristics of the included studies are described in Table 1.

The included age groups in the eight studies ranged from 7 to 19, with 5 studies focusing on younger children (7–14 years) and three studies aimed at adolescents (12–19 years). The CDI was used in five studies as a screening instrument, while the RADS was used in three studies (one used both the CDI and the RADS). In all studies, an intervention based on cognitive behaviour therapy was examined, while two studies also examined relaxation training. The number of treatment sessions ranged from 8 to 16. Most studies (6 of 8) were conducted in the United States. In only two studies, a follow-up measurement longer than three months after the intervention was conducted. All but one study reported sufficient statistics (mean and standard deviations) to calculate effect sizes directly. Four studies used a waiting list control condition, and the other four studies used a treatment-as-usual control condition. In all but one study, students were selected for the intervention on the basis of a high score on a self-report measure of depression. In the other study [5], a diagnostic interview was conducted and only students were included in the trial who did not meet criteria for a major depressive disorder (but who had subthreshold depression).

The quality of the included studies was not optimal. It was not clear in any of the studies whether allocation to conditions was done by an independent person. Random allocation concealment to respondents was not possible (when a waiting list control group was used) [8, 17, 28, 31]; or it was not reported whether this was done adequately [4, 18, 21, 33]. Blinding of the assessors of outcomes was done in only three studies [8, 31, 33]. Drop-out, however, was no higher than 21% in any of the studies, and was even zero in two studies [17, 33].

Effects of psychological interventions at post-test

We could compare the effects of the psychological treatments at post-test to control conditions in the 8 studies with 12 contrast groups (Table 2), totalling 413 students. The mean effect size was 0.55 (95% CI: 0.35–0.76). We have plotted the effect sizes and 95% confidence intervals of the individual contrast groups in Figure 1. The heterogeneity in this meta-analysis was very low (*Q*=12.32 n.s.; I^2=10.7%).

Table 2 Proportion of students randomized to conditions, proportion of gained positive outcomes, and numbers of needed to screen

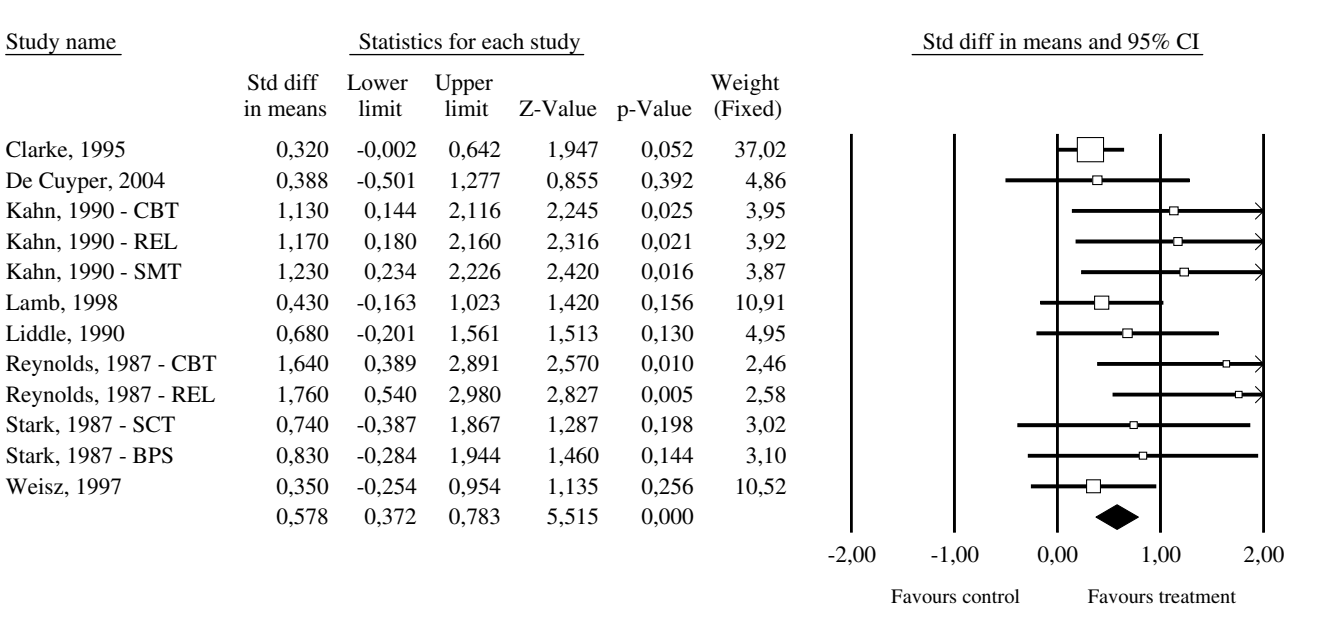
				Positive outcomes[a]			
	N	N_{rand} /1000		Exp	Contr	N_{pos}	NNS
Clarke et al., 1995	1652	91	–				
De Cuyper, 2004	630	32	–				
Kahn et al., 1990	1293	53	▪ CBT	15/17	1/6	37	27
			▪ Relaxation training	11/17	1/6	27	37
			▪ Self-modelling treatment	12/17	1/6	29	34
Lamb et al., 1998	222	185	–				
Liddle & Spence, 1990	380	82	–				
Reynolds & Coats, 1987	754	40	▪ CBT	5/6	0/5	28	36
			▪ Relaxation training	6/8	0/5	26	38
Stark et al., 1987	372	78	▪ Self control therapy	7/9	1/5	45	22
			▪ Behavioural problem solving	6/10	1/5	31	32
Weisz et al., 1997	500	96	▪ CBT	8/17	5/32	33	30
OVERALL	5803	72				32	31
95% CI		70.8–73.2				21–43	27–32

[a] number of positive outcomes/total group

Abbreviations: N_{rand}/1000: number of subjects randomised to conditions per 1000 screened subjects; Exp: experimental group; Contr: control group; N_{pos}: number of gained positive outcomes per 1000 screened (number of subjects with a positive outcome who would not have a positive outcome without the intervention, per 1,000 subjects screened); NNS: number needed to screen in order to have one additional positive outcome

Since the weight of one study (the one focussing on subthreshold depression [4]) was considerable (37%), we conducted a new meta-analysis in which this study was excluded. This resulted in a somewhat larger effect size (d=0.72; 95% CI: 0.45–0.99), while heterogeneity was still very low (Q=8.82 n.s.; I^2=0).

We could calculate the longer term effects of the interventions compared to (care-as-usual) control conditions in only two studies [5, 34]. In the first study [5] an effect size d of 0.12 was found after one year, and in the other study [34], an effect size d of 0.64 was found. Since the number of effect sizes was too small and the follow-up periods dif-



Meta Analysis

Fig. 1 Effects of school-based treatments of depression

fered, we did not try to integrate these results in a meta-analysis.

Numbers needed to screen

First, we calculated for each study the proportion of screened subjects who met inclusion criteria for the intervention trial, who gave informed consent (including parental informed consent) and who were actually randomised. In Table 2, the number of randomised subjects is reported per 1,000-screened students. As can be seen, this number was very in high in one study (185 students per 1,000), but ranged in the other studies from 32 to 96 per 1,000, with a mean of 72 (95% CI: 70.8–73.2).

Next, we selected the studies in which dichotomous outcomes at post-test were presented, indicating how many subjects in the experimental condition were improved or recovered, compared to subjects in the control conditions. This resulted in four studies [17, 28, 31, 33], with eight comparisons between experimental and control conditions. The criteria that were used in these four studies to decide whether or not a subject had improved or recovered are presented in Table 1. These criteria differed considerably per study, and we expected that the pooling of these data would result in a strongly heterogeneous outcome. However, this was not the case. The pooled OR was 3.97 (95% CI: 2.12–7.11), with very low heterogeneity (Q=1.12 n.s.; I^2=0).

Then we calculated for each of the eight comparison groups how many positive outcomes would have been realised in the randomised group (compared to the control group), if they had all received the intervention. This number ranged from 26 to 45 per 1,000-screened students, with a pooled average of 32 (95% CI: 21–43).

Finally, we calculated the number of subjects that have to be screened in order to generate one positive outcome. This NNS ranged from 22 to 38, with an average of 31 (95% CI: 27–32).

Discussion

In this study, we found promising results of interventions in which school populations are screened for depression and treatment is provided to the ones with high levels of depressive symptomatology. The mean effect size of these interventions is 0.55, which can be considered moderate to high. And the number of students that have to be screened in order to generate one positive outcome was found to be 31, which seems quite low. This indicates that in one class of about 30 students, depression in one child can be relieved with a screening plus early intervention procedure. This can be considered to be very low, considering the burden of disease from depression and the often poor outcome. In a school with 1,000 students, the screening and intervention procedure would result in 32 positive outcomes.

Although these results seem quite promising, this study has several important limitations. First, the number of studies eligible for inclusion was small and their quality was not optimal, which was further limited by the fact that in several of these studies students from only one school were screened. However, the meta-analysis of the effects of these intervention programs resulted in a relatively stable mean effect size with few indications of heterogeneity. The number of studies for which we could calculate the numbers-needed-to-screen was even smaller.

A second major limitation was the absence in most studies of follow-up measurements, because of which we could not get clear evidence about the longer-term effects of these programs.

Third, in only one of the eight included studies was a diagnostic interview used to establish the presence or absence of a major depressive disorder in participating students. In the other studies, inclusion was based on a high score on a selfrating depression scale. Therefore, we cannot be sure that participating students in the interventions actually suffered from clinically relevant depression. However, because the students were sufficiently motivated to participate in the interventions and they and their parents gave informed consent, we can assume that the students somehow benefited from the intervention and that the majority did have clinically relevant depressive symptoms, although they probably did not meet all diagnostic criteria for a major depressive disorder.

Due to these limitations, the results of these analyses should be considered with caution. Despite these limitations, however, our study gave clear indications that screening and early intervention in schools may be an effective strategy to reduce the burden of disease from depression in children and adolescents. And there is no doubt that further research in this area is warranted.

However, even when further research does indeed indicate that screening and early intervention is effective, several questions have to be answered before such interventions can be used in routine practice. One important question that has to be answered is whether screening and early intervention may have negative effects [14]. For example, it may be well possible that a screening instrument might indicate that a student is depressed, while this is not the case. It is not currently known what consequences this may have for this student and his or her parents. Likewise, a positive score on a screening instrument may lead to

stigmatisation of the student. And it is not clear how many students participate in the intervention without having any benefit from it. Before routine application of this type of intervention is considered, we also need to know more about the longer-term effects, the effects in routine practice, and the cost-effectiveness.

Although cognitive behavioural intervention were examined in all studies, there were not enough studies to examine whether specific psychotherapies were superior to other psychotherapies. More research is needed to examine this issue.

Depression is an important health problem, especially in children and adolescents, and the results of our study are very promising. This should create an impetus for more research on the possibilities of early screening and intervention.

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